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I, JANENE PEISKER, TEAM LEADER EXAMINATION SUPPORT AND SALES hereby certify that annexed is a true copy of the Provisional specification in connection with Application No. 2004901367 for a patent by TELEZYGOLOGY INC. as filed on 16 March 2004.

WITNESS my hand this
Thirty-first day of March 2005

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JANENE PEISKER
TEAM LEADER EXAMINATION
SUPPORT AND SALES

AUSTRALIA
Patents Act 1990
PROVISIONAL SPECIFICATION
FOR A PROVISIONAL PATENT

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Invention Title: Multi Functional Fasteners

The following statement is a description of this invention

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This invention relates to fasteners. In particular, this invention relates to a particular type of network of fasteners.

Monitoring of equipment status is becoming increasingly important. As one example, an aircraft monitoring system has been introduced recently under the 5 name "Airplane Health Management". The intention of such a monitoring system is to assist in streamlining aircraft maintenance and to minimise disruption to flight schedules.

A monitoring system such as the "Airplane Health Management" system desirably can carry out the functions of collecting data about the aircraft or other equipment 10 being monitored and transmit the data to a central or remote processing system. For the aircraft example, the remote processing system may be on board the aircraft or it may be on the ground, so that problems, or potential problems, have already been identified before the aircraft lands. Maintenance can then be ready with the necessary labour schedule and/or parts to service the aircraft.

15 It is understood that aircraft maintenance is a significant cost, which at present is continuing to increase. It is also understood that a 10% reduction in maintenance costs may increase net profit by up to 40%.

It is an object of this invention to facilitate monitoring systems, especially monitoring systems in aircraft, but not limited to that application. It is a further 20 object of this invention to enable not only monitoring but also a system which enables an action to be taken in response to the situation monitored.

Reference is made to International Patent Application No. PCT/AU2003/000759, (the contents of which are incorporated herein by reference) which was published as WO2004/001235 ("the International Patent Application"). The International 25 Patent Application discloses in its second aspect a network or system of fasteners, in which each fastener includes an address means to distinguish that fastener from the other fasteners in the network. The fastener can be any fastener, including the

fastener disclosed in the first aspect of the invention in the International Patent Application.

The fastener in that first aspect may be intelligent and may have a second function which makes use of the intelligence or switching capacity of the fastener. An 5 example is given of a vehicle which has several of the fasteners in intelligent form. The fasteners have a first function which enables the fixing and releasing of light bulbs in the vehicle. The fasteners have a second function, which is to sense the amount of ambient light and to turn the light bulbs on or off depending on the amount of light sensed. Data as to the amount of ambient light is sent to a central 10 processor which activates the fastener according to desired criteria as to automatic switching on or off of the lights.

The International Patent Application also discloses that the fastener may include a sensor able to convey information as to the condition of the fastening element included in the fastener in one embodiment and the actuating means (in the same 15 embodiment). The sensor may sense the current state of the fastening element (engaged or disengaged). The sensor may sense to allow optimised control of the application of energy to the actuation means. The sensor may sense in order to report performance, degradation or impending failure of the fastening element or actuation means.

20 The present invention represents a further aspect of the network of fasteners disclosed in the International Patent Application. In this further aspect, the network of fasteners has one or more of the following characteristics.

- (a) the fasteners are distributed throughout an assembly in an ordered pattern;
- 25 (b) the fasteners are distributed throughout an assembly to form a three dimensional network.

As already indicated in the International Patent Application, the fasteners may be any suitable fasteners, including those disclosed in the International Patent Application.

The fasteners may be networked in any way as disclosed in the International Patent Application or in any other suitable way. For example, the fasteners may be networked by hard wiring or by, for example, "blue tooth" communication or by other wireless means.

The fasteners may communicate with each other and/or with a central monitor, such as a computer, in any one or more of the following ways: by cable, by wireless link, by custom radio link, "Blue Tooth", "Zigbee", "Wifi" (802.11), inductive coupling, infra-red, microwave, visible light or using ultra-sound or other acoustic energy. Wireless link may be via an external system, which then communicates with the fasteners in the network, for example by global positioning system (GPS), by SMS or MMS, by GPRS or by Wifi to an internet access point.

15 The foregoing examples are not limiting with respect to the invention.

Preferably, the network of fasteners is distributed throughout the assembly so as to provide, essentially, a three dimensional model of the assembly.

The assembly can be chosen from a wide range of objects. For example, the assembly may be a building, a motor vehicle, an aircraft or any of a myriad of other objects.

Whether the fasteners are distributed throughout the assembly in an ordered pattern or to form a three dimensional network, it is not essential that every fastener in the network is multi-functional. However, it is preferred that every fastener is multi-functional.

25 The invention may be particularly useful in providing to a central monitoring point an environmental picture of all or most of the assembly at the location of each

fastener. For example, a fastener or a group of fasteners may sense ambient temperature and compare this to the temperature sensed by another fastener or group of fasteners. The comparison may activate some of the fasteners. For instance, if the assembly is a building and a temperature differential is detected by 5 comparison of the temperature reports from various fasteners or groups of fasteners, air conditioning may be activated, or one or more windows in the building may be opened or closed, or both air conditioning and windows may be activated. This can provide automatic temperature control. The fasteners may take part in the activation, for example, by releasing a window biased to the open 10 position. Alternately, the fasteners may report to an activating mechanism which then carries out the required task.

The network of fasteners may pass on other sensed data, for example to a computer which analyses and displays the real time situation against the ideal state. For example, the assembly may be a building and the network of fasteners may be used 15 to adjust the lighting levels in response to natural light availability. As another example, the fasteners in the building may detect fire at an early stage, by sensing an unacceptable rise in temperature (and activate an alarm or water sprinklers, for example). The fasteners may report overstressing or damage to a fastener in the system and control the situation by increasing the level of fastening of adjacent 20 fasteners or by activating a redundant fastener. The network of fasteners may function to release a particular part of the assembly in an emergency. For example, in case of fire or explosion, the network may instruct certain fasteners to release part of the assembly such as a beam or a door if this is calculated to reduce the seriousness of the outcome of the fire or explosion.

25 The fasteners may have a single function in addition to the fastening function, or some or all of the fasteners may have more than one additional function. For example, a fastener may be both heat sensitive and light sensitive as well as having its primary fastening function.

It will be apparent to one skilled in the art that the invention has an extremely wide range of application. Some further examples are referred to below. It is to be understood that these are not limiting on the scope of the invention.

5 The assembly may be the hull of an oil tanker. The network of fasteners may be adapted to detect breach to the hull and generate an alarm.

The network of fasteners may be built into the frame of an aircraft and sensitive to changes in temperature, thus being able to detect, at an extremely early stage, that a fire has started, for example in an electrical system. The generation of an alarm at this early stage can enable swift action to prevent major damage.

10 The network of fasteners may be built into the body of a military vehicle and be adapted to detect the presence of chemicals or adverse biological conditions, and cause action to be taken to ensure the safety of the occupants or generate an alarm.

Especially in the case of the fasteners disclosed in the first aspect of the International Patent Application, the sensors may be incorporated in the fasteners 15 in a very economical manner. There can be virtually no extra costs in including a suitable sensor in the electronic chip controlling the fastener.

As indicated above, the response of the fastener to the sensor may be to release or fasten, or may be to generate some other type of response, such as an alarm or activate another mechanism.

20 The invention will now be described in relation to a non limiting example thereof, in conjunction with the attached drawings in which:

Figure 1 is a perspective view of an aircraft showing a network of fasteners according to the invention; and

Figure 2 shows the network of fasteners of Figure 1 excluding the aircraft.

Figure 1 shows an assembly which is an aircraft 10 having a network of fasteners 20 (refer Figure 2) distributed throughout the aircraft. Each fastener 12 (some only are labelled) has a primary function of holding the aircraft assembly 10 together. The fasteners 12 are within some cases within the aircraft 10, in other cases just beneath the internal or external skin 14 of the aircraft 10 and in other cases penetrating the skin 14 (similarly to a rivet) on a conventional aircraft assembly.

It is an option that other fasteners (not shown) are included in aircraft 10 but are not part of the network of fasteners 20. Some of these fasteners which are not part of network of fasteners 20 may be present in case of need (redundancy) or may not 10 be part of the network of the fasteners 20 for some other reason.

Fasteners 12 in network 20 may, for example, report on whether those fasteners 12 which hold engine 16 to mounting 18 are stressed in any way. If any stress is detected, other fasteners 12 in the vicinity of the stressed fasteners may increase the degree of fastening in order to make up for any shortcoming in fastening by the 15 stressed fastener or fasteners.

Similarly, fasteners 12 located between skin 14 and the aircraft lining (not shown) may report on any significant rise in temperature, which may indicated commencement of a fire, for example in electrical cabling.

It is to be appreciated that this invention has wide application and that the scope of 20 the invention is not limited to the specific examples.

Dated this 15th day of March, 2004

Telezygology Inc.

By its Patent Attorneys

Chrysiliou Law

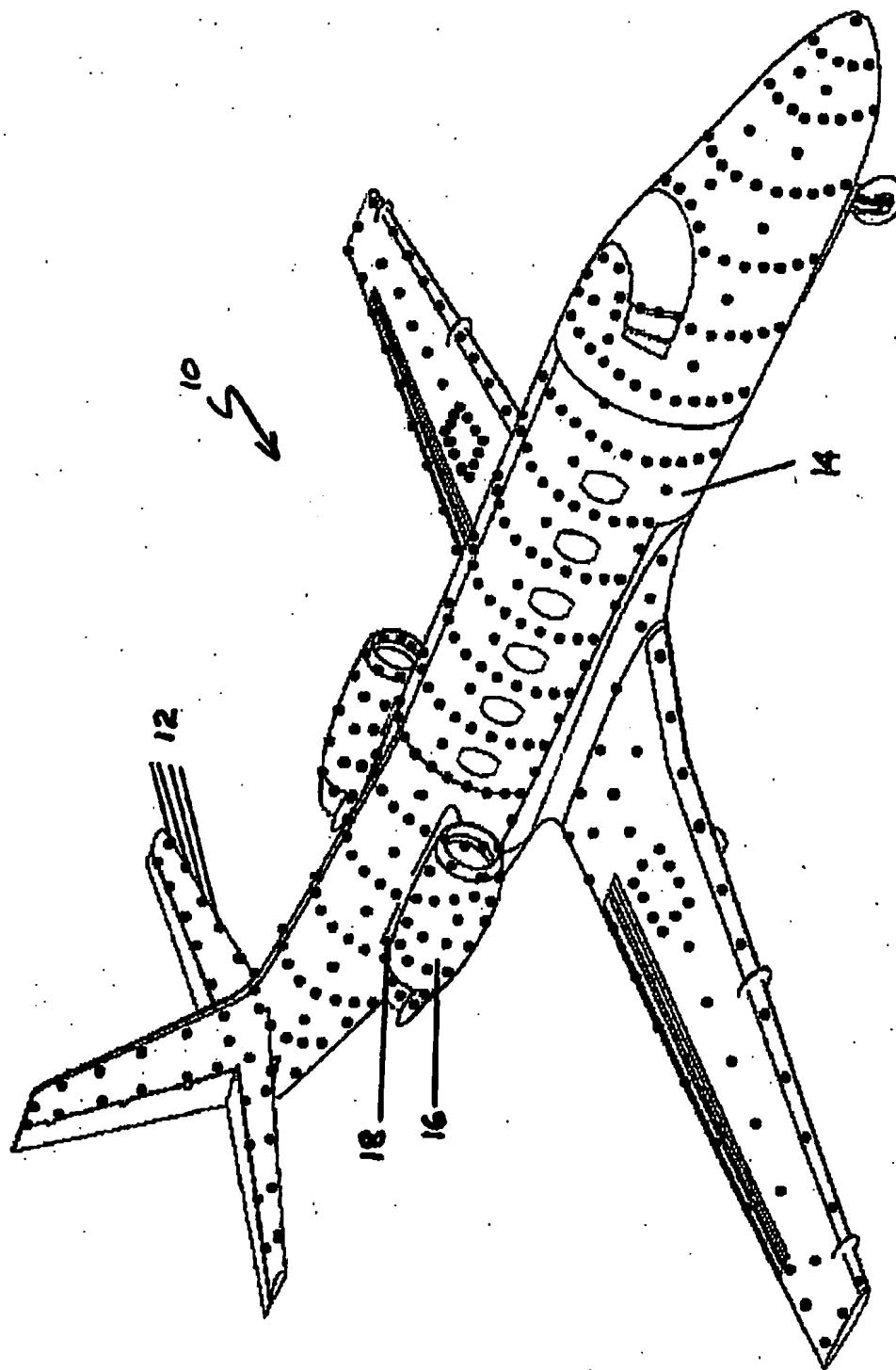


FIGURE 1

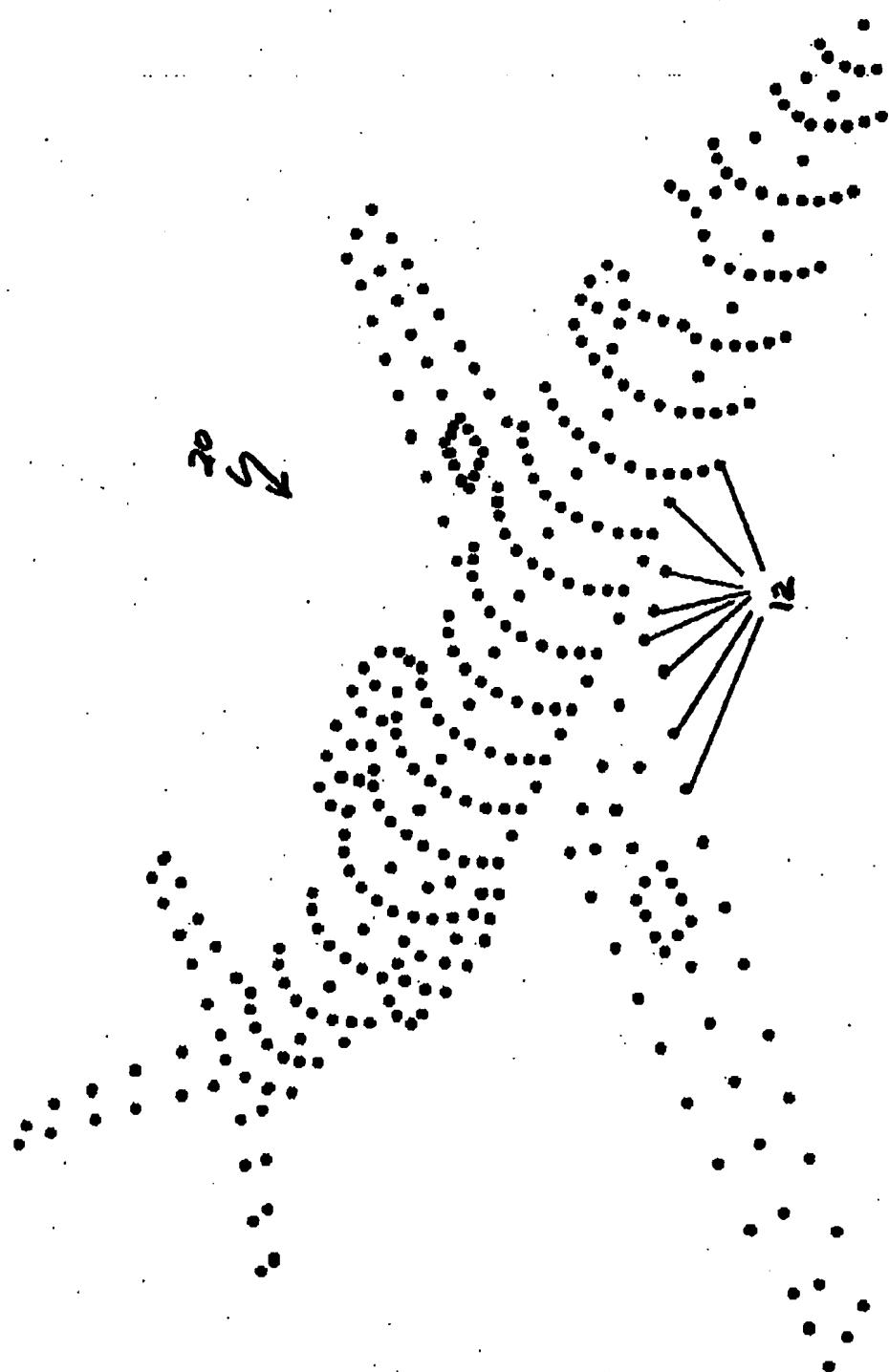


FIGURE 2